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PROJECT 15a

RECONNAISSANCE AND CRUISE OF THE APPLEGATE RIVER UNIT

MEMORANDUM-
for

Dr. A. D. Hopkins

February - March, 1916

F. P. Keen
1916

NOTES ON ATTRACTION OF BEETLES, ASHLAND AREA, LAMB'S MINE UNIT, PROJECT 15A (ROGUE RIVER NATIONAL FOREST) ALSO J.M. MILLER'S LETTER CONCERNING SAME

F.P. KEEN
1916

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The following memorandum is based upon pleminary investigations made by Mr. J.M.Miller in the fall of 1914 and a more detailed cruise made by the writers from February 15th to March 4th, 1916.

OBJECT OF CRUISE.

This cruise was made in accordance with the Outline of Supplementary Project 15a. Investigation of Dendroctonus Beetles, As outlined by Dr. A.D.Hopkins, and under assignments and supervision of Mr.J.M.Miller.

As stated in the outline of Project 15a, the object of this cruise was to secure data on- (a) The character and extent of depredations by Dendroctonus beetles during periods for which there was any record or evidence. This divided itself into two parts, 1st, To determine the status of the present infestation, whether declining, normal or aggressive; 2nd, To determine the amount of infestation, over the entire area, in order to give a reliable basis for the application of the percentage principle.

LOCATION OF AREA.

LOCATION OF AREA.

The Applegate River watershed lies in the southern portion of Jackson County, Oregon, about 20 miles west of Ashland, Oregon. It drains a large basin of the north slope of the Siskiyou Range, the waters emptying into the Rogue River near Grants Pass, Oregon.

RELATION TO ADJACENT AREAS.

The Applegate River watershed is simply one unit in the infested Yellow Pine areas of Southern Oregon and Northern California.

To the south and seperated from it by the high crest of the Siskiyou Range which is either rocky and bare or covered with firs, hemlocks, and other Alpine species, is the Klamath River area, in which the infestation by D. brevicomis has been under observation for some time.

To the west is a rather high ridge seperating the Applegate basin from that of the Illinois River.

To the north is the broad Rogue River valley with considerable infestation on both its slopes. This infestation probably extends on north as far as the Yellow Pine occurs.

To the east is a fairly high divide seperating the Applegate watershed from the Ashland Creek watershed. The higher elevations of this divide are covered with the Alpine types, (hemlock, red fir, etc), while thru the lower gaps the Yellow Pine connects the two areas.

AREA INVOLVED.

In the present cruise an area was taken with the natural boundaries mentioned above to the south, east and west, and with an arbitrary boundary on the north cutting across the valley near the town

of Ruch.

This area included the following townships in the Williamette Meridian:-

T. 38 S.	R. 2 W.	7 secs.	
T 38 S	R 3 W 10	secs.	
T 39 S	R 1 W	10 secs.	
T 39 S	R 2 W	33 secs.	
T 39 S	R 3 W	36 secs.	
T 39 S	R 4 W	17 secs.	
T 40 S	R 1 W	27 secs.	
T 40 S	R 2 W	36 secs.	
T 40 S	R 3 W	36 secs.	
T 40 S	R 4 W	26 secs.	
T 41 S	R 3 W	6 secs.	
Total			244 secs.

CHARACTER OF AREA.

This area divided itself into main areas. The Little Applegate River watershed and the Big Applegate River with its tributaries.

The Little Applegate River flows in a general northwest direction, hence its two main slopes were practically north and south exposures. The northern exposures were heavily timbered with about 60% Douglas fir and 40% Yellow pine; while the southern exposures were either bare, or heavily covered with brush with scattering pine trees. Further up the river each side was about equally divided and covered wi wtth a moderately heavy stand of Yellow pine.

Practically all of the infestation in this section was confined to the southern exposures and the canons which come in from this side. As the headwaters of the Little Applegate was reached, the Yellow pine was gradually replaced by a heavy Douglas fir stand, and at the upper altitudes by hemlock and red fir.

On the Big Applegate, the west slopes on the lower streches of the river represented this same condition of heavily brushed areas with scattering pines. However, in general, on the main river the

west slopes were more heavily infested than the east slopes. At the headwaters of the main branch and the larger tributaries, Yellow pine was replaced by the firs, while the peaks and ridges were for the most part bare or supposting a haevy growth of chaparral.

INDICATIONS OF PAST INFESTATIONS.

One of the very noticeable things on this area was the conspicuous amount of ghost trees, snags, fallen trees, and broken tops indicating that the infestation in this region was not of recent origin.

Since a considerable portion of this area has been burned over by fires both old and recent, which have destroyed the evidence of beetle work, no accurate estimate of the amount of past infestation was possible. But from general observations it would appear that on certain sections which have been free from fire, from 35% to 50% of the stand has been destroyed by beetles. The most noticeable destruction has occured on ridges and southern exposures similar to those now heavily infested by the beetles; although even the north slopes show a considerable proportion of snags and ghost trees.

From conversations with the residents of the section, infestation has only been noticed in the last few years. It would appear that the infestation has only of late been of sufficient proportions to attract attention, but such data is of little value.

METHODS OF ESTIMATING.

Since the methods used in making this cruise were somewhat different from those used on former estimates, it is probably well to describe them in some detail.

To determine the amount of infestation over the entire area, it was covered by a general survey. This was done by traversing the main and secondary ridges and plotting on township maps the total number of trees that could be seen with the aid of field galsses, on th opposite ridges and slopes. By means of a very good U.S.G.S. Topographical map, it was possible to locate these trees in their respective sections.

Those sections which were later cruised were first estimated in this way and the proportion of trees actually found on these sections to those estimated, served as abasis for determining the amount of the entire area. For example it was found on the Little Applegate, due to the irregularity of the country that only one third of the trees on a section could be counted from the opposite ridges. Thus the estimate on this and adjoining sections that were not closely cruised was increased three times over the first estimate of the section. It was found that this approximated conditions very closely.

On the Big Applegate most of the infestation,due to the long almost unbroken slopes, could be cruised from the opposite slopes, and here the estimate of a section was in proportion to the actual cruise of the section as 1 is to 1.5. Hence the estimate on the adjoining sections was increased 50%.

This method of procedure gives a much more reliable estimate of the total infestation than a mere guess could possibly give.

METHOD OF CLOSE RECONNAISSANCE.

Due to the very limited time, and the concentration of the infestation in large centers, the usual cruising methods of running strips through the sections were found to be inadvisable. With the aid of a

very good U.S.G.S. Topographical map the section boundaries could be quite easily determined, hence, instead of spending valuable time running strips back and forth over large brush areas or heavy slopes of Douglas fir growth, the large groups of infested trees were spotted and every tree examined. It was possible in this way to examine all of the infested trees on a section without wasting any time on the uninfested portions. Following this method practically all of the large centers were examined over the entier area, while with the usual strip method it would have been possible only to cover 2 or 3 sections.

MARKING THE TREES.

All of the trees examined were marked in such a way that on recruising the area the past condition of the trees would be certain. With a scribe, those trees killed by D. brevicomis during 1915 were mar marked with the Roman numeral V, and were stamped with a U.S. marking axe, once for the first generation trees, twice for the second and three times for the third generation trees. Overwintering trees of 1914 were marked with the Roman numeral IV, and stamped twice with the marking axe. A blaze and notch were cut in top killed trees and trees killed by insects other than D. brevicomis, were simply stamped with a single U.S.

RECORDS.

For the areas which were estimated, township plats were used as before mentioned. For those sections which were cruised, the regular section plats were used, symbols and diameters indicating the different trees, insects responsible and generation to which they belonged.

Besides this, records were kept on special blanks, of all trees

representing the overwintering broods. These notes included a description of the bark, foliage, size and diameter of the trees, and all notes on secondary insects, predators, woodpecker work etc. These have been summarized in table III.

PRESENT INFESTATION.

Table I shows the amount and character of the infestation on the cruised sections. These trees were all examined and marked.

Of the total 847 trees examined, 240 contained overwintering broods of the 1915 infestation. This shows an increase over twice that of 1914 which is represented by 105 trees.

One interesting factor is the large proportion of top-killed trees, or those which showed no infestation upon a basal examination. One tree cut showed this to be the work of Ips sp. (probably oregonus), and it is reasonable to suppose that a large proportion of death to the tops is due to this cause.

These totals obtained from examination of these 847 trees, serve as a basis for the estimated proportion of infested trees over the rest of the area.

Table II, shows the total estimated infestation over the entire area by townships, and includes those sections actually cruised as also those estimated.

Thus in this table, 1630 trees represent the total number of trees estimated to be present over the entire area, which contains the present overwintering broods of beetles.

An application of the percentage principal to this number of trees should show the number of trees which should be removed from the large centers in order to esatablish control over the area.

DISTRIBUTION OF INFESTATION.

The map accompanying this memerandum shows the distribution of the infestation over the area, It will be noted that on the Little Applegate watershed, the infestation was scattering in character, the only well defined centers being on Rush Creek and Sterling Creek. (Sec 19,T 39 S R 1 W and Secs. 4,6,9, T 39 S R 2 W).

On the Big Applegate River, however, the infestation was very noticeably in large groups seperated by practically clean areas. Some of the largest and more important of these groups were located as follows;-

T 39 S R 3 W, Secs. 27, 29, 32, 34.
T 40 S R 3 W, Secs. 6, 9, 17, 26, 28, 35.
T 40 S R 4 W, Secs. 13.

Most of the groups were on the slopes of the main valley and very conspicuous from the valley floor, leading one to believe that the rest of the area was similiary infested. Howerver, the tributaries to the west contained no large groups and only scattering infestation. The tributaries to the east however, contained more infestation with a few large centers in and around Squaw Lake, and on French Gulch. The tributaries further south and at higher elevations were practically clean.

CONDITION OF OVERWINTERING BROODS.

From notes taken on 185 of the trees containing overwintering broods of Dendroctonus brevicomis, the following data contained in Table III, was summarized.

The "Examples" represent as near as possible the development examples used in Dr. A. D. Hopkins' "Seasonal History Studies of Dendroctonus brevicomis". The condition of brood, period of attack, etc. was obtained by comparing the condition of the examined trees condit-

ion of its brood, etc. with trees on the Ashland Area, the attack and development of which were known; and had been followed through.

It will be noted that the majority of the broods come under Example 3 or that representing the overwintering mature larvae.

First pupae were found on Feb 20th, and were found abundantly on the south side of trees from that date on. This early development was undoubtedly due to the very warm weather which prevailed from the 1st of February to the last of the month. It is also interesting to note that, contrary to to expectations, the later attacks in the fall of 1915, represented by Examples 1 and 2, were upon increasingly larger trees. The average diameters increasing from 22.7 to 25.5, 27.4 and 28. inches respectively.

Trees on southern exposures predominate with those on eastern and western next in order.

In Examples 3 and4, redtop trees predominate.

In Example 3, red and sorrel top trees are about equal in number.

In Example 2, sorrel tops predominate as in Example 1.

In Example 1, however, practically every tree was green at the base. (the tables only refer to the condition of the upper one-half of the trees foliage).

Bark was found to be loose on nearly all of the trees of Example 3, and most of the trees of Example 4. While all of the trees of Examples 1 and 2 had the bark still tightly adhering to the sapwood.

Woodpeckers preffered trees containing the fattest larvae, showing less preference for those of Examples 2 and 2-1 and ignoring those with eggs altogether.

The secondary insects were also much more prevalent in trees of Example 3, having probably abandoned trees of Example 4 and not having

fully established themselves in trees of the later broods.

INFESTATION OTHER THAN DENDROCTONUS BREVICOMIS.

IPS SP.

Next to D. brevicomis the most destructive insect encountered was Ips sp. (probably Ips oregonus). Infestation by this insect occured in large groups of small trees 4 to 12 inches in diameter. One group examined contained 63 trees killed in 1914 and 12 trees containin 1915 broods. In most trees parent adults and new adults predominated. In other trees parent adults, eggs, larvae, pupae, and new adults were found. In many of the large D. brevicomis groups it was quite evident that the tops had been killed first by the Ips. An interesting feature, which has probably been noted before, was the fact that in every case where a group of Ips were killing the trees, Dendroctonus brevicomis was found associated with them or in nearby trees. The large group mentioned above of 63, 1914 and 12, 1915 Ips killed trees, was surrounded by 1 large D. brevicomis tree of the 1914 overwintering generation, 5 large trees containing overwintering broods of the 1915 2nd generation, and 2 large topkilled trees. The large trees gave indications of having been killed the year before in the tops. This was an isolated group of trees surrounded by brush areas for a radius of one-half mile; and the association of the two insects was very striking.

DENDROCTONUS MONTICOLAE, Hopk.

Infestation by this species was very scant. Only one tree was found infested exclusively by this insect, while in several instances it was found associated with D. brevicomis. The galleries of the

latter cutting across those of D. monticolae.

FLATHEAD LARVAE.

Only a very few trees were found which had been killed by flatheads. The attack being confined for the most part to rather small isolated trees.

DENDROCTONUS VALENS, LeConte.

Several trees examined indicated that the work of this beetle was primary and that the attack of D. brevicomis had followed it. Some trees found where broods of D, valens had developed and left the trees while D. brevicomis broods were only in the early stages.

MAP AND PHOTOGRAPHS.

The map accompanying this memorandum shows the location and amount of the present infestation by Dendroctonus brevicomis as determined by this cruise.

The photographs show the character of the country, density of the stand and illustrate in general the nature of the country covered.

RECONNAISSANCE COSTS.

Table IV. shows the time occupied in cruising the Applegate Basin together with costs of making the estimate etc. the work being done by two men.

SUMMARY.

The Applegate Basin is simply one unit in the infestation of Dendroctonus brevicomis which extends thruout southern Oregon and Northern California.

The evidence shows that in this area the infestation has been of

long standing, and is not the result of recent invasion.

A comparison of the overwintering broods of 1914 and 1915 show an increase of more than double.

In general, the infestation is located in large groups or centers, which would simplify control operations and the application of the percentage principle.

The cruised sections in which the trees were marked to show the status of the present infestation, will serve as reliable areas to determine the progress of the infestation in future cruises. An interesting feature will be the later examination of those trees which were top-killed, to determine whether the beetles of the next generation are attracted to them/.

On account of the complex overlapping of generations during the period of activity in the summer and fall, a future cruise should be made during the winter of 1916 and 1917 in order that the overwintering broods of 1915 and 1916 may be compared. Such a comparison would give a good index to the progress of the infestation.

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Very respectfully submitted,

F.P.Keen,
J.E.Patterson,

Entomological Rangers.

Forest Tree Seed Insect Station,

Ashland, Oregon.

March 24, 1916.

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APPENDIX TO

MEMORANDUM
ON

RECONNAISSANCE AND CRUISE OF THE APPLEGATE UNIT.

UNIT TREES.

In order to have some established basis for the application of the percentage principle, for estimating the quantity of beetles in the different development exa,ples, for comparing the amount of infestation on different areas where the size of the trees are totally different and for some basis for estimating cost of control operations, a unit tree is here devised and submitted for your consideration.

The basis is upon the surface of infested bark, 1000 square inshes being the unit and a tree 24 inches in diameter and 80 feet high, containing 50,000 square inches of infested bark being the unit tree.

Table V, is a table in 1000's of square inches of infested bark for trees of different diameters and heights. It does not pretend to be accurate, as very little data on infested lengths for different size trees is available, but it will serve as an approximate basis until it can be corrected from more actual field data, than we now have.

Al that is needed in field notes is the diameter, height, and proportion of bark infested. (such as ½ infested, ¼, total infestation etc.). From such notes, the number of Unit trees can easily be obtai obtained from the table by adding together the 1000's of inches of infested bark as shown in the table for the different size trees at hand, and dividing by 50, the area for the unit tree.

Or simply knowing the diameter, the % of the tree infested and the "Site Class" to which the tree belongs, the number of square inches

of infested bark may be obtained and the number of unit trees represented, determined.

"Site Class" as used by the Forest Service cruisers indicates the condition of the stand in which the tree is found, and from tables compiled from many observations show the heights to which trees of different diameters grow under such conditions. Thus in Table V. the heavy line marked "Site 1" represents height of trees and area of infested bark for trees of different diameters in the most luxuriant stand of Yellow pine found on the Plumas National Forest, Calif. on north slopes and in moist conditions. "Site II" is for average growth found on level moderately dry areas, and "SiteIII", gives the corresponding infested areas of bark for scrubby growth of pine found on rocky slopes and unfavorable conditions. "Site Class" tables for conditions on the Applegate Area are not at hand but probably could be obtained. Hence Table III of this memorandum, the number of Unit Trees was computed from notes on the diameter, height and % of infestation of the trees considered.

Even with the present inaccurate table of infested bark surface for trees od different diameters and heights (Table V), unit trees computed on this basis give a much more reliable estimate of the amount of infestation than merely the actual number of trees could give.

The number of Unit Trees representing the different developments examples are given in Table III.

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Very respectfully submitted,

F.P.KEEN,
~~J.E.PATTERSON,~~

TABLE I.

Location. -----	Overwintering 1915 2nd Gener.	1915, 1st Generation.	1914, 2nd Gen. overwintering.	Topkilled trees.	Ips killed in 1915.	Ips killed in 1914.	Flathead killed trees.
T 39 S R 1 W, Sec 19	35	22	28	21	13	15	
" 2 " 7	4	3	3				
" 2 " 8	13	12	16	11			
" 2 " 18	10	3	3	20	12	63	
" 2 " 33	7	1	2	7	3		
" 3 " 12	11	2	3	7			
" 3 " 13	3			10			2
" 3 " 21	5			9			
" 3 " 22	8	1		6	5		
" 3 " 27	14	3	7	5	3		
" 3 " 29	35	6	8	50	9		
" 3 " 32	17	1	9	52	1		1
" 3 " 33	5	1	6	6			
" 3 " 35	5	2	3	4			
T 40 S R 3 W " 3	1	4	3	7			
" 3 " 4	5		1	1			
" 3 " 5	1	2		7			
" 3 " 6	9	5	2	14	4		
" 3 " 7	10	5	2	2	16		
" 3 " 9	11	3	2	10			
" 3 " 17	6			2	1		
" 3 " 19	3						
" 4 " 12	1		1				
" 4 " 13	21	8	6	18	8		
Totals -----	240	84	105	262	75	78	3

********** 847

TABLE II. ESTIMATED INFESTATION.

Townships.	No. of Sections.	Overwintering 1915 2nd. Gen.	1915 1st Generation	Overwintering 1914 2nd Gen.	Top killed trees.	Totals.
T 38 S R 2 W	7	120	38	45	110	
" 3 W	10	55	16	22	55	
T"39 1 W	10	100	55	70	85	
" 2 W	33	330	131	135	335	
" 3 W	36	275	70	105	340	
" 4 W	17	55	16	28	60	
T"40 1 W	27	55	28	38	65	
" 2 W	36	220	65	100	220	
" 3 W	36	310	112	120	280	
" 4 W	26	100	33	43	105	
T 41 3 W	6	10	6	14	25	
Totals -----	244	1630	570	720	1680	4600
Aver per sec.		6.7	2.3	3.	6.9	18.9

TABLE IV. COST OF CRUISE.

Period of cruise - February 15, 1916 to March 4, 1916.

Time occupied in	Total days.	Cost per day.	Total cost.	Total area. sq. miles	Square miles per day.	Cost per square mile.	Total number trees.	Cost per tree.
Estimating	5	$ 8.80	$ 44.00	244	48.8	$ .18	4600	$.0095
Cruising	10	$ 3.80	$ 88.80	20	2.	$ 4.40	847	$.104
Traveling	2	$ 7.250	$ 14.50					
Total	17	$ 8.62	$ 146.50	244				

NOTE;- The total cost includes Transportation, Subsistence, Incidentals, and Salaries of two men for 18 days.

TABLE III.

(Note:- The numbers in the table refer to the number of trees representing the condition noted).

Development Examples.	Notes on previous condition of the broods.	Number of trees.	Average diameters.	Number of unit trees.	Feb 15, ---- Mar 4, 1916. Condition of broods upon examination.							Cond trees			Exposure					Condition of foliage at top.					Bark.			Other Insects in trees.	
					Emergence.	New adults	Pupae.	Full grown larvae.	Small larvae.	Eggs.	Parent adults.	Thrifty	Mature.	Decadent.	North.	South.	East.	West.	Open.	Black.	Red.	Sorrel.	Fading.	Green.	Loose.	Tight.	Woodpeck. work.	Secondary insects.	Predacious insects.
Examples 4 and 3 Overwintering of Examples 8 and 9 (in part)	Trees attacked during Aug'15 First larvae Sept 1 to 12th. Some adults emerged in Oct. Rest of brood overwintering as new adults and larvae. First pupae Feb 20, 1916.	17	23.5	17.7	17	8	1	17				10	6	1		9	6	2		1	8	8			17		4	Cerambycid larvae 3 D. valens 1 Flathead lar. 1 Ips sp. 1 Staphylinids 1	Elonium longum 2
Example 3, Overwintering of Example 9.	Attack from Sep 12 to Oct 16. First larvae " 12 to " 21 First pupae Feb 20, 1916.	102	22.7	99.2			29	102			5	66	34	2	1	45	29	22	5	1	51	50			69	33	84	Cerambycid larvae 12 D. valens 16 Ips 4 Hister sp. 1 Staphylinids 1	Elonum longum 18 Clerid 4 Trogositidae 1
Example 2. Overwintering of Example 10.	Attack from Oct 1 to Oct 15. First larvae " 15 to Nov 1. Overwintering very small larvae with parent adults.	23	25.5	31.1				18	11	2	17	10	13		2	4	10	4	3	1	5	11	3	3	12	11	13	Cerambycidae 1 D. valens 2 Ips 2 Staphylinids 1 Diptera 1	Elonium longum 7
Examples 2 and 1 (part). Overwintering of Example 11, (in part).	Attack from Oct 15 to Nov 1. Very small larvae developing and overwintering with eggs of parent adults.	25	27.4	30.6					25	12	25	15	9	1		11	5	9	2	2	5	16	2			25	2	D. valens 1 Ips sp. in top 2	Elonium longum 1
Example 1 (in part). Overwintering Example 11, (in part).	Attack from Nov 1 to about the middle of the month. Eggs laid. Overwintering eggs and parent adults.	18	28.	23.5						18	18	11	6	1		5	8	5	[illegible]	[illegible]	[illegible]	[illegible]	2	2		18		D. valens 5 Ips sp. in tops 2	Elonium longum 1
Totals.----	----------	185	24.3	202.1	17	8	30	137	36	32	65	112	68	5	3	74	58	42	8	5	73	95	7	5	98	87	104		

TABLE V. UNIT TREES.

USE THIS TABLE FOR DETERMINING NUMBER OF UNIT TREES.

Diameter breast high (inches)	HEIGHT OF TREE (IN FEET).																	
	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
	SURFACE OF INFESTED BARK (IN 1000's OF SQUARE INCHES).																	
8	6	8	11	14	17													
10	7	11	14	18	21	25	29											
12	8	12	16	21	25	29	33	37										
14	9	14	18	23	27	32	37	41	46									
16	10	15	20	25	30	36	40	45	50	55	60	65						
18	11	16	22	27	33	38	44	49	55	60	66	71	77					
20	--	18	24	30	36	42	48	54	60	66	72	78	84	96				
22	--	19	26	32	39	46	52	58	65	71	78	85	91	98				
24	--	--	28	35	42	50	56	63	70	77	84	91	98	105	112			
26	--	--	30	38	45	53	60	68	75	83	90	98	105	113	120	128		
28	---	--	--	40	48	56	64	72	80	88	96	104	112	120	128	136		
30	--	--	--	--	51	60	68	77	85	94	102	111	120	130	137	145		
32	--	--	--	--	54	63	72	82	91	100	109	118	127	136	145	154	163	
34	--	--	--	--	57	67	76	86	96	105	115	124	134	143	153	162	172	
36	--	--	--	--	61	71	81	91	101	111	121	131	141	151	161	171	181	191
38	--	--	--	--	64	74	85	95	106	117	127	138	149	159	169	180	190	200
40	--	--	--	--	--	76	89	100	111	122	133	145	156	167	178	189	200	212
42	--	--	--	--	--	82	93	105	117	128	140	152	163	175	186	198	210	222
44						85	98	110	122	134	146	158	171	183	195	207	219	232
46						88	101	114	127	140	152	165	178	190	203	216	229	242
48						90	103	116	129	142	155	168	181	194	207	219	232	245
50						96	111	123	137	151	164	178	192	206	219	233	247	260
52						100	114	129	143	157	172	186	200	215	229	243	258	272
54						105	119	134	149	164	179	194	208	224	238	254	268	283
						Site III.				Site II.		Site I.						

To find the number of unit trees;- Add surface of bark corresponding to diameter and height as given in above table, for each tree concerned, and divide by 50.

L. Southern exposure of Little Applegate River. Considerable scattering infestation was found on these brushy open hillsides with their scattering stand of pines.

2. On Sterling Creek, looking west. Note the large open spots with scattering brush and little or no forest cover.

PLATE I.

PLATE IX.

1. Photo by J.E.Patterson.

2. Photo by J.E.Patterson.

1. Little Applegate River, looking east. Note the dense growth of pine and fir on the north slope, and the open scattering stand of pine, with brush areas on the south. These northern exposures contained practically no infestation.

2. Glade Creek, at headwaters of The Little Applegate. Infestation was very scarce in these heavier timbered sections.

PLATE II.

Photo by J.E.Patterson.

1. Steamboat Creek, looking west. Practically no infestation was noted in this country. Note the fairly dense quality of the stand.

2. On the headwaters of the Big Applegate River. Looking south toward the Siskiyou Divide which seperated the Applegates from the Klamath area.

PLATE III.

PLATE X.

Photo by J.E.Patterson.

1. Squaw Lake, Oregon, Looking north. Some large groups of infested trees were found on the south slopes shown in the center of the picture.

2. Squaw Lake. Looking north. Considerable infestation was found in the vicinity of this lake.

PLATE IV.

1. Squaw lake, looking north toward Squaw Peak.

2. The Big Applegate River near mouth of Squaw Creek. Note the abundance of fir. Very little infestation was found in this vicinity.

PLATE V.

1. The Big Applegate River. Note the scattering character of the trees in this vicinity.

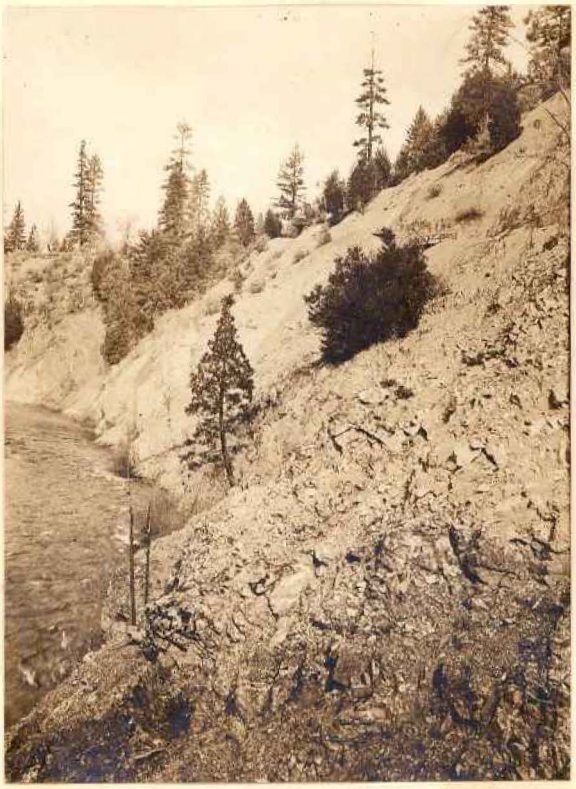
2. On the Big Applegate River, Oregon.

PLATE VI.

1. Yellow Pine killed by Dendroctonus brevicomis. Note the abumdance of woodpecker-work. Palmers Creek, Oregon.

2. On the Big Applegate River, showing the rocky character of some of the slopes near the river.

PLATE VII.



1. Moonlight, Big Applegate River, near Starr Ranger Station, Oregonn

2. The little Applegate River near Sterling Creek, Oregon.

PLATE VIII.

1. Looking down the Big Applegate River. Note the scattering pines in the foreground. This is a characteristic eastern exposure on the main river.

2. Beaver Creek, looking south. Note the way in which the pines pinch out on the peaks and ridges. The majority of the infestation was found about midway up on these slopes.

PLATE IX.

1. The Big Applegate River and Valley, looking south up the river from ridge above ChinahGulch. Note the clouds hanging on the Siskiyou Divide in the distance.

2. The Little Applegate Canon from the north end of The Seven Mile Ridge. Steamboat Mountain in the extreme distance. Note the scarcity of forest cover on the south slopes.

PLATE X.

1. The Sterling Mine at the head of Sterling Creek. Some infestation was found in the pines adjacent to this mine.

2. Another view of the Sterling Mine.

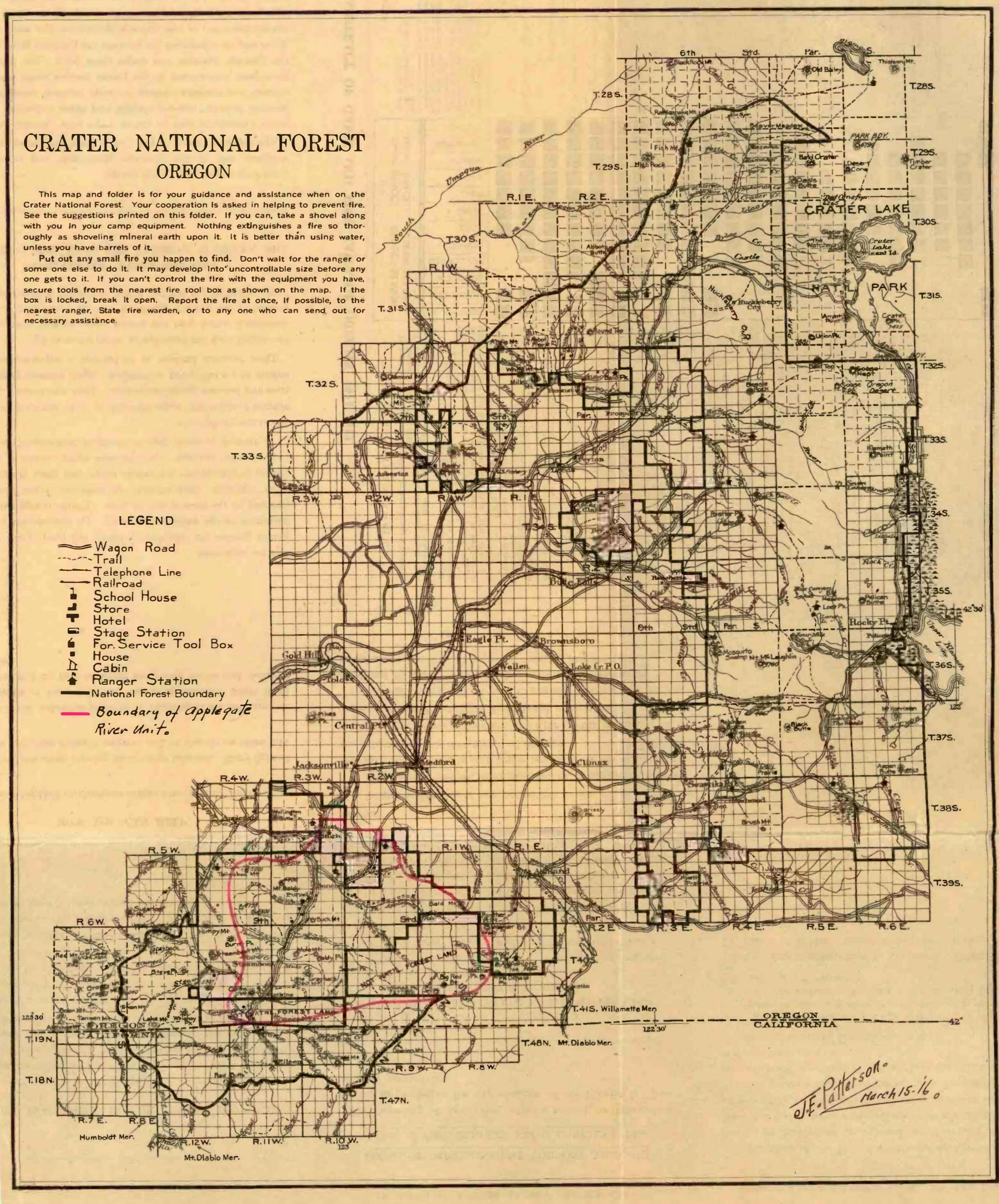
PLATE XI.

CRATER NATIONAL FOREST

OREGON

This map and folder is for your guidance and assistance when on the Crater National Forest. Your cooperation is asked in helping to prevent fire. See the suggestions printed on this folder. If you can, take a shovel along with you in your camp equipment. Nothing extinguishes a fire so thoroughly as shoveling mineral earth upon it. It is better than using water, unless you have barrels of it.

Put out any small fire you happen to find. Don't wait for the ranger or some one else to do it. It may develop into uncontrollable size before any one gets to it. If you can't control the fire with the equipment you have, secure tools from the nearest fire tool box as shown on the map. If the box is locked, break it open. Report the fire at once, if possible, to the nearest ranger, State fire warden, or to any one who can send out for necessary assistance.



WHAT WOULD HAPPEN IF THE FORESTS WERE DESTROYED.

timber industry has been the main contributor to develop- on the Pacific Coast. Its revenues are shared alike by rs, farmers, merchants, artisans, and professional men. If mber were burned up many industries would be destroyed, ll citizens would suffer.

U ARE INTERESTED IN THE LUMBER INDUSTRY.

lumber industry is, and, if the timber is protected, will long e biggest industry on the Pacific Coast. At present it pro- each year a revenue to the community of $125,000,000. s same region timber that would yield, at the same rate, a ue amounting to $40,000,000, is destroyed annually by fire.

s injury is as widespread as it is unnecessary. Even if you own a stick of timber you are interested in the income d from its manufacture. Almost all of the money received the lumber industry goes to pay for labor and supplies in tate in which the timber grew. On every thousand feet d or wasted the people bear over 80 per cent of the loss. e owner loses is the stumpage value.

HOW YOU CAN HELP.

ber that carelessness causes fires; precaution prevents

oss away burning matches or tobacco. Bury lighted d cigar stubs in mineral soil, or else throw them into

he unlawful practice of building camp fires against , or logs, or in any vegetable matter. Build them oil by first scraping away the leaves and decayed

4. Do not build larger camp fires than are necessary.

5. Extinguish all fires completely before leaving them, even for a short time.

The law requires these precautions.

Offenses against the Federal fire laws, passed by Congress May 5, 1910, are punishable by a maximum fine of

$5,000, OR IMPRISONMENT FOR TWO YEARS,

OR BOTH, IF A FIRE IS SET MALICIOUSLY,

and

$1,000, OR IMPRISONMENT FOR ONE YEAR, OR

BOTH, IF FIRE RESULTS FROM CARELESSNESS.

The Secretary of Agriculture offers a reward for information leading to conviction for any violation of the Federal fire laws affecting public lands.

WHAT THE OREGON STATE FIRE LAWS PROHIBIT. HELP ENFORCE THEM.

1. Burning of slashings, choppings, woodlands, or brushland, between June 1 and October 1 without a permit and without care to confine the fire.

2. Setting or causing fire to be set on land of another without permission from the owner; willfully or negligently allowing fire to escape from your own land; accidentally setting fire on land of your own or of another and allowing it to escape without using every possible effort to extinguish it.

3. Setting of fire unlawfully with intent to injure property of another.

4. Willful destruction of any posted fire notice.

5. If fire occurs through willfulness, malice, or negligence, damages may be recovered in civil action against those responsible to the extent of double the amount of damage.

6. Persons or corporations are liable for the full amount of all expenses incurred in fighting fires caused in violation of the law.

7. One half of fine will be paid to anyone, except fire wardens employed by State, who furnishes information leading to the arrest and conviction of any one violating the fire laws.

YOU ARE INTERESTED IN PUBLIC HEALTH AS WELL AS PREVENTION OF FIRES.

Each Year Hunters, Campers, Tourists, and Forest Rangers Contract Typhoid Fever or Enteric Disorders from the Pollution of Streams.

Ordinary Care will Prevent Them. The Law Requires It.

Regulations of the U. S. Department of Agriculture prohibit having or leaving in an exposed or insanitary condition on National Forest lands camp refuse or débris of any description, or depositing on National Forest lands, or in the streams, lakes, or other waters within or bordering upon National Forests, any substance which pollutes or is likely to cause pollution of the said streams, lakes, or waters.

Section 2131 of the laws of Oregon says:

> If any person shall put any excrement, or any putrid, nauseous, decaying, deleterious substance in any spring, brook, or branch of running water, he shall be deemed guilty of a misdemeanor * * *.

Report any offenses either to the nearest Forest Ranger or to Dr. Calvin S. White, Oregon State Board of Health, Portland, Oregon.

8—1933

THE CRATER NATIONAL FORES

This Forest contains practically all that is left una of the former favorite hunting grounds of the Indi region. It lies in two blocks. The more northerly block extends on the northwest to the crest of th Mountains and on the northeast to the boundary of Lake National Park. Lake-of-the-Woods, Fish Lake Mile Lake are in the southern part of this block, whi the southern end of the Cascade Mountains; the bas River and its tributaries lies between the Umpqua Mo the Cascade Plateau, and drains them both. The t have been constructed by the Forest Service make tourists and pleasure seekers the trout streams, mou hunting grounds, mineral springs, and other recreati while a mountain road to Crater Lake runs through northern end of the Siskiyou Mountains, and ex California to the crest of the divide.

THE NATIONAL FORESTS ARE OPEN FOR PL AND FOR PUBLIC RECREATION.

All National Forests are public property, maintai benefit of the public. They are open to every kind occupancy which does not reduce their value to the or conflict with the principle of equal rights to all.

Their primary purpose is to provide a self-rene supply and a regulated streamflow. They support tries and prevent timber monopoly. They also prote against overgrazing, while assuring to local stockmen use of the forage crop.

Camping, hunting, fishing, trapping, prospecting, in the Forests are free. Only for uses which convey benefit to individuals is a charge made, and there ar tions whatever upon mineral development other imposed by the general mining laws. Timber is sold permitted on the same terms to all. Do not hesitat Forest Ranger for information about any kind of you are interested.

ABSTRACT OF GAME AND FISH LAWS OF OREGON, 1911-1912.

BAG LIMITS.

BUCK DEER	5 in one season.
DUCKS	35 in any 7 consecutive days.
GEESE AND SWAN	No limit.
PRAIRIE CHICKENS	5 in one day or 10 in 7 consecutive days.
SAGEHENS AND COCKS	5 in one day or 10 in 7 consecutive days.
QUAIL	5 in one day or 10 in 7 consecutive days.
Native Pheasants and Grouse	5 in one day or 10 in 7 consecutive days.
Shore and Wading Birds	50 in one week.
TROUT	75 in one day (except Klamath County).
TROUT	Klamath County, 25 in day, or equal to 50 pounds.
TROUT	In Rogue River or its tributaries. (Open all year.)
BASS	No limit. (Open all year.)
SALMON TROUT	No limit. (Open all year.)

BUCK DEER—In counties not named below.

BUCK DEER—In Baker, Grant, Harney, Malheur, Umatilla, Union, and Wallowa Counties.

CHINESE PHEASANTS—Closed until October 15, 1913.

NATIVE PHEASANTS and GROUSE—In counties not named below.

NATIVE PHEASANTS and GROUSE—In Baker, Grant, Umatilla, Union, and Wallowa Counties.

QUAIL—In counties not named below.

QUAIL—In Jackson and Josephine Counties; limit, 10 in one day or 20 in 7 consecutive days. Closed until October 15, 1913, in Gilliam, Grant, Harney, Malheur, Morrow, Wheeler, and Umatilla Counties.

PRAIRIE CHICKENS—In counties not named below.

PRAIRIE CHICKENS—In Grant, Harney, and Umatilla Counties, closed indefinitely.

SAGE HENS AND SAGE COCKS.

SILVER GRAY SQUIRRELS.

DOVES OR WILD PIGEONS.

DUCKS—In counties not named below.
(Ducks can be sold from November 15 to December 15.)

DUCKS—In Clatsop, Columbia, Multnomah.

DUCKS—In Grant, Harney, Malheur, Morrow, Union, Umatilla, and Wallowa Counties.

DUCKS—In Coos, Curry, and Lake Counties.

DUCKS—In Klamath County.

GEESE AND SWAN—In counties not named below.

GEESE AND SWAN—In Baker, Grant, Harney, Klamath, Lake, Malheur, Sherman, Union, and Wallowa Counties.

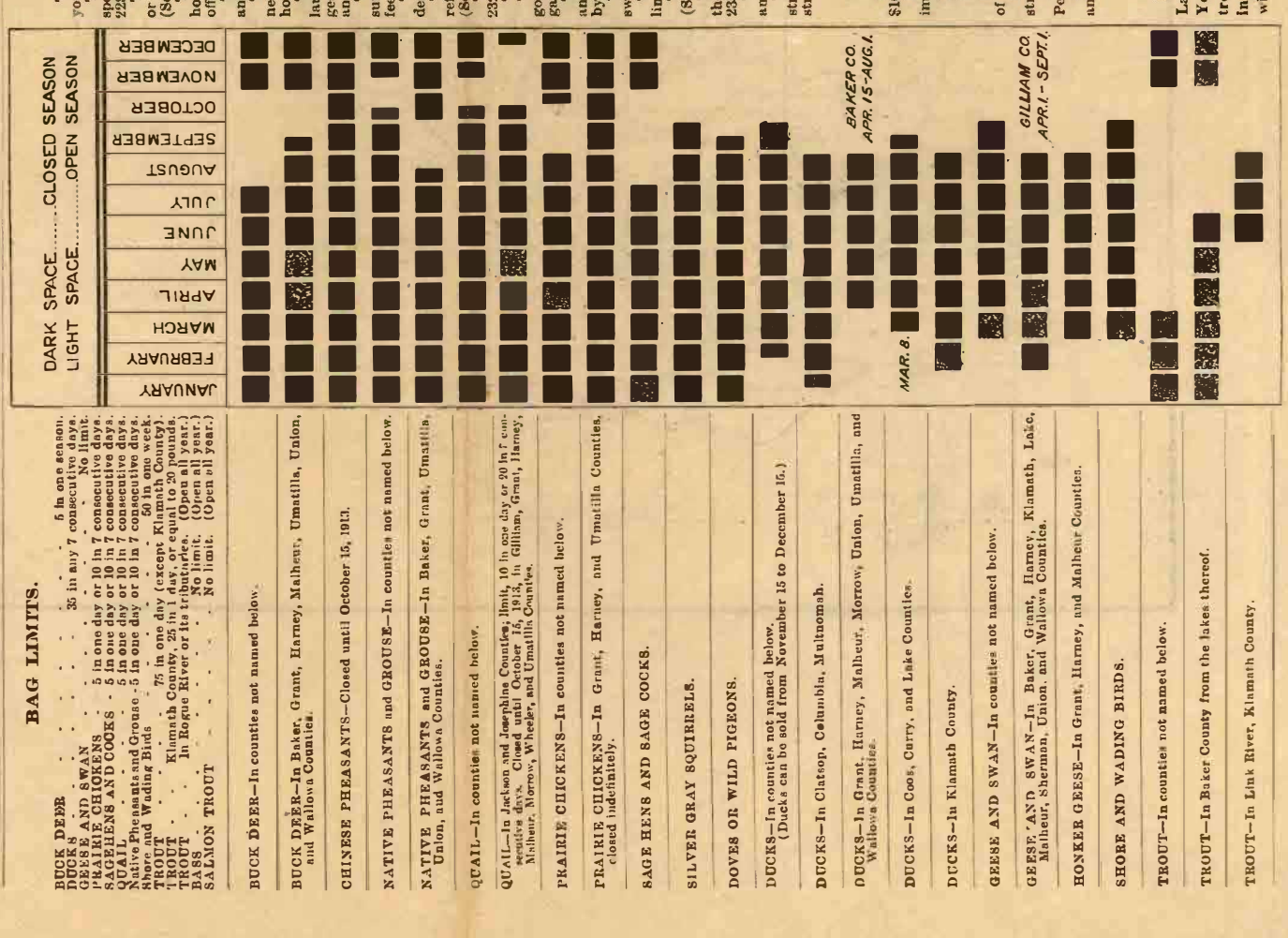
HONKER GEESE—In Grant, Harney, and Malheur Counties.

SHORE AND WADING BIRDS.

TROUT—In counties not named below.

TROUT—In Baker County from the lakes thereof.

TROUT—In Link River, Klamath County.



NOTICE.

It will be appreciated if you will report violations of Game Laws to WILLIAM L. FINLEY, State Game Warden, 808 Yeon Building, Portland, Oregon. All communications will be treated as strictly confidential. Your name will not be brought into any case without your permission. Copies of game laws will be sent free upon application to his office.

PENALTIES.

Hunting on game refuges, both fine and imprisonment, $50 to $100, and thirty days to six months in county jail.
Fine to transport game outside of this State, $100 to $500, or imprisonment.
Violation of game laws, $25 to $1,000, or imprisonment.
To hunt or fish without a license, $25 to $150, or imprisonment.
Violating any of the fish laws, $25 to $150, or imprisonment.
Fine for the use of powder, gas, lime, etc., in any of the streams of this State, $200 to $3,000.
Fine for casting sawdust, planer shavings, etc., in any of the streams of this State, $50 to $500.
For deer hide tags apply to any County Clerk or Justice of the Peace.
Hunters and Anglers' license issued by every County Clerk, good anywhere in Oregon.